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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 545 617 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92310764.3**

(51) Int. Cl.[5] : **H02P 9/30**, H02J 7/24

(22) Date of filing : **25.11.92**

(30) Priority : **29.11.91 US 801765**

(43) Date of publication of application :
09.06.93 Bulletin 93/23

(84) Designated Contracting States :
DE FR GB IT

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(54) Method and apparatus for filtering alternator ripple using synchronous sampling.

(57) A circuit for filtering the ripple in an output of a multi-phase alternator in a vehicle system having a regulating circuit (24) that regulates the output of the alternator includes a switch (20) connected in series between a system voltage (21) and the regulating circuit (124), and means for closing the switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator. The means for closing the switch (20) operates to close the switch (20) at a conduction switchover point among the stator windings in synchronism with a voltage waveform of the at least one of the stator windings, and is timed to produce an aliased waveform for application to the regulator. The output of the switch is applied to an integrator for integrating the output voltage from the alternator during an entire time cycle period of one of the windings of the stator coils for application to the regulator.

A method for filtering the ripple in an output of a multi-phase alternator in a vehicle includes providing a switch (20) in series between a system voltage (21) and a voltage regulating circuit (24) and closing the switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator.

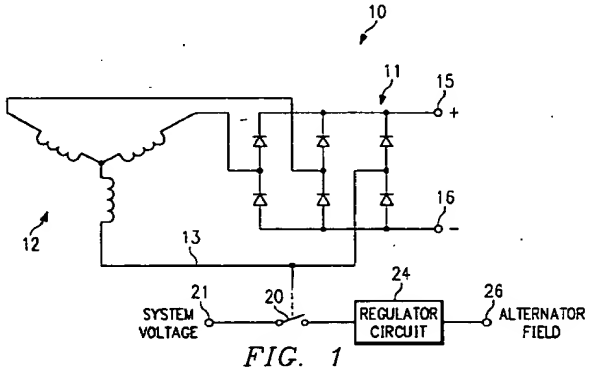

FIG. 1

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This invention relates to improvements in filter circuitry for use in conjunction with alternators of the type used in automotive or vehicular applications, and, more particularly, to improvements in methods and apparatuses for filtering the ripple in a multi-phase alternator in a vehicle system employing synchronous sampling techniques.

Most modern automobile and venicle electrical systems employ alternators driven by the vehicle engine to source electrical energy for the electrical circuitry of the vehicle, as well as to charge the battery of the vehicle. Typically, the output of an alternator is a three-phase, AC signal that is rectified by a trio of diode pairs. The resulting output to the vehicle has a ripple associated with it. The ripple causes several problems in the vehicle, the most obvious of which is a whine in the radio when tuning very weak stations. The ripple also causes problems for the alternator voltage regulator. The output voltage from the alternator is generally specified to accuracies of 0.1 volts or so, but the ripple can be higher than 5 volts in American cars, and higher still in European applications, especially where the battery is in a remote location such as the trunk of the vehicle.

A major problem encountered in voltage regulator designs is filtering the ripple to enable the actual system voltage to be accurately sensed. The normal approach is to use an analog low pass filter, requiring at least a capacitor external to the integrated circuit performing sensing and regulation functions. Most regulators are mounted directly to the alternator, and are therefore located in a very hostile environment from a temperature and vibration point of view. Such conditions demand that a minimum number of components be used for best reliability.

In light of the above it is, therefore, an object of the invention to provide an improved filter for use in conjunction with an automotive alternator to reduce ripple in sensing the output voltage of the alternator. It is another object of the invention to provide a method and apparatus of the type described which reduces or eliminates the need for analog filters from the sensing channel of an automotive alternator.

It is another object of the invention to provide an improved method and apparatus of the type described which automatically adapts to the operating mode and speed of the alternator with which it is used.

These and other objects, features, and advantages will become apparent to those skilled in the art from the following detailed description, when read in conjunction with the accompanying drawings and appended claims.

The invention in its broad aspect presents a circuit for reducing the ripple in an output of a multi-phase alternator in a vehicle system having a regulating circuit that regulates the output of the alternator. The circuit includes a switch connected in series between a system voltage and the regulating circuit, and means for closing the switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator. The means for closing the switch operates to close the switch at a conduction switchover point among the stator windings in synchronism with a voltage waveform of the at least one of the stator windings, and is timed to produce an aliased waveform for application to the regulator. The output of the switch is applied to an integrator for integrating the output voltage from the alternator during an entire time cycle period of one of the windings of the stator coils for application to the regulator.

In accordance with another broad aspect of the invention, a method for reducing the ripple in an output of a multi-phase alternator in a vehicle is presented. In accordance with the method, a switch is provided, connected in series between a system voltage and a voltage regulating circuit. The switch is closed at a predetermined phase of the voltage of at least one of the stator windings of the alternator.

The invention is illustrated in the accompanying drawing in which:

Figure 1 is an electrical schematic diagram of a circuit for filtering the ripple in an output of a multi-phase vehicle alternator, in accordance with a preferred embodiment of the invention.

And Figure 2 is a comparison of voltage wave forms produced by a vehicle alternator (solid line) and produced by a single stator phase sense voltage device (dotted line).

Figure 1 shows an alternator ripple filter circuit 10, in accordance with a preferred embodiment of the invention. The circuit 10 includes a plurality of "Y" connected stator windings that produce AC output waveforms which are rectified in a rectifier network 11. The rectifier network 11 includes three sets of diode pairs, the commonly connected anodes of which producing the negative output and the commonly connected cathodes of which producing the positive output for delivery to the electrical system of the vehicle (not shown) with which the circuit 10 is employed. The respective coils of the stator windings are connected to the respective anode and cathode junctions of the pairs of diodes in the rectifier network 11, as shown. The wave form of the voltage produced at the plus and minus terminals 15 and 16 is shown by the solid line curve in Figure 2.

One of the lines 13 interconnecting one of the coils from the stator assembly 12 to an anode-cathode connection of one of the rectifier pairs is used to sense the voltage produced by the stator winding assembly 12. The voltage wave form seen on line 13 is seen by the dotted line wave form shown in Figure 2. The stator voltage may be derived, for example, from one of the stator coils on a line 13 that may be connected to the connection between the diodes of a diode array of the type generally employed in

conjunction with most alternator systems. Such sampling node is typically existing in most alternator systems, for example to signal "no rotation" of the rotor, to indicate a broken drive belt, or other such problem.

A circuit is employed using the signal developed on the line 13 to minimize the ripple that is produced on the output terminals 15 and 16. The circuitry includes a switch 20 which is opened and closed by the signal on the line 13. The switch 20 may, for example, be a semiconductor power switch transistor or other suitable device. The switch 20 is connected on one side to the system voltage on node 21. The system voltage may include the voltage seen at one of the battery terminals (not shown). The other side of the switch 20 is connected to a regulator circuit 24 to develop an output on node 26 that is delivered to the alternator field winding. The regulator circuit 24 may be, for example, a sample and hold circuit or the like, such circuits being known in the art, and are not described herein in detail.

The operation of the circuit switch 20 is arranged so that the switch 20 is closed at a definite time during the cycle of the wave form seen on the line 13. More particularly, the circuit 20 is arranged to close momentarily at a time when the voltage on the line 13 reaches the switch over voltage 31 when output delivered to the output nodes 15 and 16 is switched from one coil to the coil to which line 13 is connected. Thus, the regulator circuit 24 is constructed so that it can hold the voltage instantaneously appearing at the switch over point 31 until the next occurring switch over point 31' at the next cycle along the wave form seen on the line 13.

Although the invention has been described and illustrated with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example, and that numerous changes in the combination and arrangement of parts can be resorted to by those skilled in the art without departing from the spirit and scope of the invention, as hereinafter claimed.

Claims

1. A circuit for reducing the ripple in an output of a multi-phase alternator in a vehicle system having a regulating circuit that regulates the output of the alternator, comprising:
   a switch connected in series between a system voltage and the regulating circuit;
   and means for closing said switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator.

2. The circuit of claim 1 wherein said means for closing said switch operates to close said switch at a conduction switchover point among the stator windings.

3. The circuit of claim 1 wherein said means for closing said switch operates to close said switch operates in synchronism with a voltage waveform of said at least one of the stator windings.

4. The circuit of claim 1 wherein said means for closing said switch is timed to produce an aliased waveform for application to the regulator.

5. The circuit of claim 1 wherein said means for closing said switch comprises an integrator for integrating an output voltage from the alternator.

6. The circuit of claim 5 wherein said integrator integrates the voltage during a fixed fraction of said time cycle period of one of the windings of the stator coils.

7. The circuit of claim 5 wherein said integrator integrates the voltage during an entire time cycle period of one of the windings of the stator coils.

8. A method for reducing the ripple in an output of a multi-phase alternator in a vehicle comprising:
   providing a switch connected in series between a system voltage and a voltage regulating circuit;
   and closing said switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator.

9. The method of claim 8 wherein said step of closing said switch comprises timing the closing of said switch to produce an aliased waveform for application to the regulator.

10. The method of claim 8 wherein said step of closing said switch comprises closing said switch at a point at which conduction switches between the stator windings.

11. The method of claim 8 further comprising providing an integrator to provide an integrated output voltage from said switch for application to the regulator.

12. The method of claim 8 further comprising operating said integrator to integrate the output voltage from said switch during a fixed fraction of an entire time cycle period of one of the windings of the stator coils.

13. The method of claim 8 further comprising operating said integrator to integrate the output voltage from said switch during an entire time cycle period of one of the windings of the stator coils.

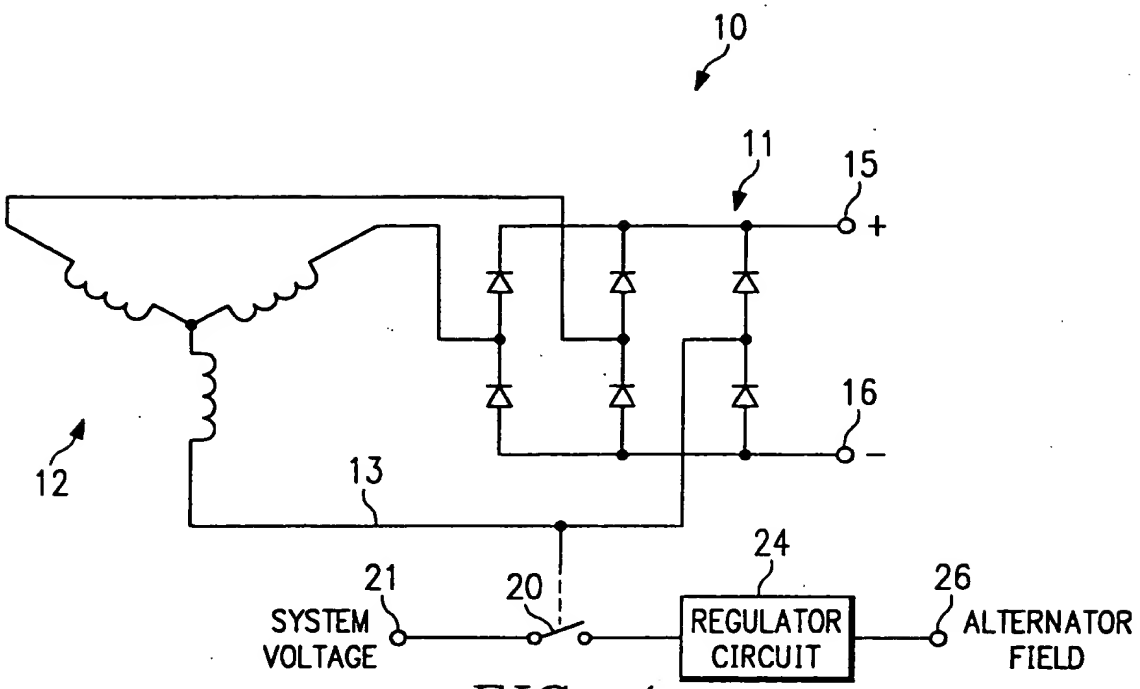

FIG. 1

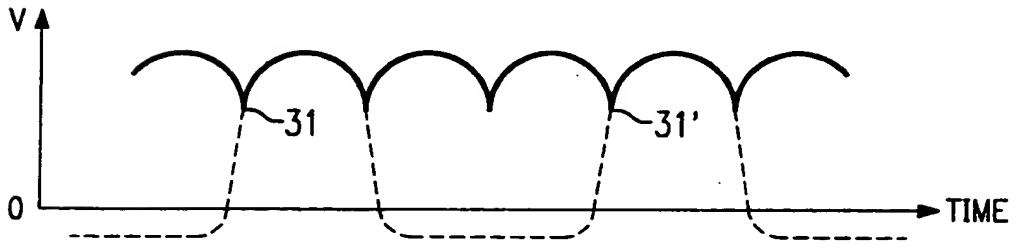

FIG. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 31 0764

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-4 872 127 (NOLAN) 3 October 1989 * column 2, line 11 - line 61; figures 1,2,9 *	1-6,8-12	H02P9/30 H02J7/24
Y	US-A-4 223 363 (SANTIS ET AL) 16 September 1980 * claim 1; figure 3 *	1-6,8-12	
A	US-A-4 128 799 (MORISHIMA) 5 December 1978 * abstract; figure 2 *	1,8	
A	PATENT ABSTRACTS OF JAPAN vol. 15, no. 265 (E-1086)5 July 1991 & JP-A-30 86 100 (HITACHI LTD) 11 April 1991 * abstract *	1,8	
A	US-A-4 599 552 (PHILLIPS ET AL.) 8 July 1986 * abstract *	5,11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H02P
H02J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 MARCH 1993	BOURBON R.

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EPO FORM 1503 03.82 (P0401)

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 545 617 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
22.01.1997 Bulletin 1997/04

(51) Int Cl.[6]: **H02P 9/30**, H02J 7/24

(21) Application number: **92310764.3**

(22) Date of filing: **25.11.1992**

(54) Method and apparatus for filtering alternator ripple using synchronous sampling

Verfahren und Vorrichtung zur Filterung der Welligkeit einer Lichtmaschine mit synchroner Abtastung

Méthode et dispositif pour filtrer les oscillations d'un alternateur en utilisant l'échantillonnage synchrone

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **29.11.1991 US 801765**

(43) Date of publication of application:
09.06.1993 Bulletin 1993/23

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US-A- 4 599 552
US-A- 4 872 127

- **PATENT ABSTRACTS OF JAPAN vol. 15, no. 265 (E-1086)5 July 1991 JPA-3086100**

EP 0 545 617 B1

Printed by Jouve, 75001 PARIS (FR)

Description

This invention relates to improvements in filter circuitry for use in conjunction with alternators of the type used in automotive or vehicular applications, and, more particularly, to improvements in methods and apparatuses for filtering the ripple in a multi-phase alternator in a vehicle system employing symchronous sampling techniques.

Most modern automobile and vehicle electrical systems employ alternators driven by the vehicle engine to source electrical energy for the electrical circuitry of the vehicle, as well as to charge the battery of the vehicle. Such alternators generally comprise a plurality of stator windings and an alternator field winding mounted on a rotor. Typically, the output of an alternator is a three-phase, AC signal that is rectified by a trio of diode pairs. The resulting output to the vehicle has a ripple associated with it. The ripple causes several problems in the vehicle, the most obvious of which is a whine in the radio when tuning very weak stations. The ripple also causes problems for the alternator voltage regulator. The output voltage from the alternator is generally specified to accuracies of 0.1 volts or so, but the ripple can be higher than 5 volts in American cars, and higher still in European applications, especially where the battery is in a remote location such as the trunk of the vehicle.

A major problem encountered in voltage regulator designs is filtering the ripple to enable the actual system voltage to be accurately sensed. The normal approach is to use an analog low pass filter, requiring at least a capacitor external to the integrated circuit performing sensing and regulation functions. Most regulators are mounted directly to the alternator, and are therefore located in a very hostile environment from a temperature and vibration point of view. Such conditions demand that a minimum number of components be used for best reliability.

US Patent No. 4,872,127 discloses a micro-controlled phase-control system in which the output of an AC source is supplied to a bridge rectifier, the bridge rectifier being controlled by circuitry which detects a cross-over point among phases of the output of the AC source. There is no attempt to address the problems associated with a vehicle system, as discussed above.

US Patent No. 4,599,552 discloses a voltage regulator circuit which includes an integrator circuit which integrates the voltage across each negative half cycle of generator output. This document is not concerned with vehicle systems and makes no attempt to solve the problems associated therewith and outlined above.

In light of the above, it is, therefore, an object of the invention to provide an improved filter for use in conjunction with an automotive alternator to reduce ripple in sensing the output voltage of the alternator.

It is another object of the invention to provide a method and apparatus of the type described which reduces or eliminates the need for analog filters from the sensing channel of an automotive alternator.

It is another object of the invention to provide an improved method and apparatus of the type described which automatically adapts to the operating mode and speed of the alternator with which it is used.

These and other objects, features, and advantages will become apparent to those skilled in the art from the following detailed description, when read in conjunction with the accompanying drawings and appended claims.

A circuit for reducing the ripple in an output of a multi-phase alternator in a vehicle system having a regulating circuit that regulates the output of the alternator is presented. The circuit includes a switch connected in series between a system voltage and the regulating circuit, and means for closing the switch at a predetermined phase of the voltage of at least one of the stator windings of the alternator. The means for closing the switch operates to close the switch at a conduction switchover point among the stator windings in synchronism with a voltage waveform of the at least one of the stator windings, and is timed to produce an aliased waveform for application to the regulator. The output of the switch is applied to an integrator for integrating the output voltage from the alternator during an entire time cycle period of one of the windings of the stator coils for application to the regulator.

According to one aspect of the present invention there is provided a circuit in a vehicle system for reducing the ripple in an output of a multi-phase alternator having an alternator field winding and a plurality of stator windings, said vehicle system having a regulating circuit having an output for delivering a signal to the alternator field winding to regulate the output of the alternator, characterised by: a switch connected in series between a system battery voltage and the regulating circuit; said switch being connected to receive a signal produced by one of the stator windings to be closed momentarily in response to a voltage waveform of said one of the stator windings at a predetermined phase of the voltage of said one of the stator windings at a conduction switchover point among the stator windings.

A method for reducing the ripple in an output of a multi-phase alternator in a vehicle is also presented. In accordance with the method, a switch is provided, connected in series between a system voltage and a voltage regulating circuit. The switch is closed at a predetermined phase of the voltage of at least one of the stator windings of the alternator.

According to another aspect of the present invention there is provided a method for reducing the ripple in an output of a multi-phase alternator having an alternator field winding and a plurality of stator windings in a vehicle having a system battery voltage and a voltage regulator circuit, characterised by: providing a switch connected in series between the system voltage and the voltage regulator circuit; developing a signal that indicates when conduction switches between first and second ones of the stator windings; in response to said sig-

nal, interconnecting the system battery voltage and the voltage regulator circuit by momentarily closing said switch at a predetermined phase of the voltage of one of the stator windings of the alternator at a time at which conduction switches between the stator windings; and regulating the output of the alternator by delivering an output of the voltage regulator circuit to the alternator field winding.

The invention is illustrated in the accompanying drawing in which:

Figure 1 is an electrical schematic diagram of a circuit for filtering the ripple in an output of a multi-phase vehicle alternator, in accordance with a preferred embodiment of the invention.

Figure 2 is a comparison of voltage waveforms produced by a vehicle alternator (solid line) and produced by a single stator phase sense voltage device (dotted line).

Figure 1 shows an alternator rippled filter circuit 10, in accordance with a preferred embodiment of the invention. The circuit 10 includes a plurality of "Y" connected stator windings that produce AC output waveforms which are rectified in a rectifier network 11. The rectifier network 11 includes three sets of diode pairs, the commonly connected anodes of which producing the negative output and the commonly connected cathodes of which producing the positive output for delivery to the electrical system of the vehicle (not shown) with which the circuit 10 is employed. The respective coils of the stator windings are connected to the respective anode and cathode junctions of the pairs of diodes in the rectifier network 11, as shown. The wave form of the voltage produced at the plus and minus terminals 15 and 16 is shown by the solid line curve in Figure 2.

One of the lines 13 interconnecting one of the coils from the stator assembly 12 to an anode-cathode connection of one of the rectifier pairs is used to sense the voltage produced by the stator winding assembly 12. The voltage wave form seen on line 13 is seen by the dotted line wave form shown in Figure 2. The stator voltage may be derived, for example, from one of the stator coils on a line 13 that may be connected to the connection between the diodes of a diode array of the type generally employed in conjunction with most alternator systems. Such sampling node is typically existing in most alternator systems, for example to signal "no rotation" of the rotor, to indicate a broken drive belt, or other such problem.

A circuit is employed using the signal developed on the line 13 to minimize the ripple that is produced on the output terminals 15 and 16. The circuitry includes a switch 20 which is opened and closed by the signal on the line 13. The switch 20 may, for example, be a semiconductor power switch transistor or other suitable device. The switch 20 is connected on one side to the system voltage on node 21. The system voltage may include the voltage seen at one of the battery terminals (not shown). The other side of the switch 20 is connected to a regulator circuit 24 to develop an output on node 26 that is delivered to the alternator field winding. The regulator circuit 24 may be, for example, a sample and hold circuit or the like, such circuits being known in the art, and are not described herein in detail.

The operation of the circuit switch 20 is arranged so that the switch 20 is closed at a definite time during the cycle of the wave form seen on the line 13. More particularly, the circuit 20 is arranged to close momentarily at a time when the voltage on the line 13 reaches the switch over voltage 31 when output delivered to the output nodes 15 and 16 is switched from one coil to the coil to which line 13 is connected. Thus, the regulator circuit 24 is constructed so that it can hold the voltage instantaneously appearing at the switch over point 31 until the next occurring switch over point 31' at the next cycle along the wave form seen on the line 13.

Although the invention has been described and illustrated with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example, and that numerous changes in the combination and arrangement of parts can be resorted to by those skilled in the art without departing from the scope of the appended claims.

Claims

1. A circuit in a vehicle system for reducing the ripple in an output of a multi-phase alternator having an alternator field winding and a plurality of stator windings (12), said vehicle system having a regulating circuit (24) having an output (26) for delivering a signal to the alternator field winding to regulate the output of the alternator, characterised by:

   a switch (20) connected in series between a system battery voltage (21) and the regulating circuit (24);
   said switch (20) being connected to receive a signal (13) produced by one of the stator windings (12) to be momentarily closed in response to a voltage waveform of said one of the stator windings at a predetermined phase of the voltage of said one of the stator windings (12) at a conduction switchover point among the stator windings.

2. The circuit of claim 1 wherein said switch (20) is timed to be closed to produce an aliased waveform for application to the regulating circuit (24).

3. The circuit of claim 1 or claim 2 further comprising an integrator for integrating an input voltage to the regulating circuit (24).

4. The circuit of claim 3 wherein said integrator integrates said input voltage during a fixed fraction of a

time cycle period of said one of the stator windings (12).

5. The circuit of claim 3 wherein said integrator integrates said input voltage during an entire time cycle period of said one of the stator windings (12).

6. A method for reducing the ripple in an output of a multi-phase alternator having an alternator field winding and a plurality of stator windings (12) in a vehicle having a system battery voltage (21) and a voltage regulator circuit (24), characterised by:

providing a switch connected in series between the system voltage and the voltage regulator circuit;
developing a signal that indicates when conduction switches between first and second ones of the stator windings (12);
in response to said signal, interconnecting the system battery voltage (21) and the voltage regulator circuit (24) by momentarily closing said switch at a predetermined phase of the voltage of one of the stator windings of the alternator at a time at which conduction switches between the stator windings (12); and
regulating the output of the alternator by delivering an output (26) of the voltage regulator circuit (24) to the alternator field winding.

7. The method of claim 6 further comprising integrating an input voltage to the voltage regulator circuit (24).

8. The method of claim 6 further comprising integrating an input voltage to the voltage regulator circuit (24) during a fixed fraction of an entire time cycle period of one of the stator windings (12).

9. The method of claim 6 further comprising integrating an input voltage to the voltage regulator circuit (24) during an entire time cycle period of one of the stator windings (12).

Patentansprüche

1. Schaltung in einem Fahrzeugsystem zur Verringerung des Wechselspannungsanteils in einem Ausgang bzw. Ausgangssignal von einem vielphasigen Synchron- bzw. Wechselstromgenerator, der eine Synchron- bzw. Wechselstromgeneratorfeldwicklung bzw. -windung und mehrere Statorwicklungen bzw. -windungen (12) hat, wobei das Fahrzeugsystem eine Regelschaltung (24) hat, die einen Ausgang (26) hat, um ein Signal zu der Synchron- bzw. Wechselstromgeneratorfeldwicklung bzw. -windung auszugeben, um den Ausgang des Synchron- bzw. Wechselstromgenerators zu regeln, gekennzeichnet durch:

einen Schalter (20), der in Serie zwischen einer Systembatteriespannung (21) und der Regelschaltung (24) angeschlossen ist;
wobei der Schalter (20) angeschlossen ist, um ein Signal zu empfangen, das durch eine der Statorwicklungen bzw. -windungen (12) erzeugt worden ist, um für einen Augenblick bzw. momentan in Reaktion auf eine Spannungswellenform von der einen der Statorwindungen bzw. -wicklungen bei einer vorbestimmten Phase der Spannung von der einen der Statorwicklungen bzw. -windungen (12) bei einem Leitungsumschaltpunkt unter den Statorwindungen bzw. -wicklungen geschlossen zu werden.

2. Schaltung nach Anspruch 1, in der der Schalter (20) zeitlich gesteuert wird, um geschlossen zu sein, um eine gefaltete Wellenform zum Anlegen an die Regelschaltung (24) zu erzeugen.

3. Schaltung nach einem der Ansprüche 1 oder 2, die ferner eine Integrationsschaltung aufweist, um eine Eingangsspannung zu der Regelschaltung (24) zu integrieren.

4. Schaltung nach Anspruch 3, in der die Integrationseinrichtung die Eingangsspannung während einem festen Teil einer Zeitzyklusperiode der einen der Statorwicklungen bzw. -windungen (12) integriert.

5. Schaltung nach Anspruch 3, in der der Integrator die Eingangsspannung während einer gesamten Zeitzyklusperiode der einen der Statorwicklungen bzw. -windungen (12) integriert.

6. Verfahren zum Verringern des Wechselspannungsanteils in einem Ausgangssignal eines vielphasigen Synchron- bzw. Wechselstromgenerators, der eine Synchron- bzw. Wechselstromgeneratorfeldwicklung bzw. -windung und mehrere Statorwicklungen bzw. -windungen (12) in einem Fahrzeug hat, das eine Systembatteriespannung (21) und eine Spannungsregelschaltung (24) hat, gekennzeichnet durch:

ein Schalter wird zur Verfügung gestellt, der in Serie zwischen der Systemspannung und der Spannungsregelschaltung angeschlossen ist;
ein Signal wird erzeugt, das anzeigt, wenn die Leitung zwischen einer ersten und einer zweiten der Statorwindungen bzw. wicklungen (12) schaltet bzw. umschaltet;
in Reaktion auf das Signal werden die Systembatteriespannung (21) und die Spannungsregelschaltung (24) verbunden, indem für einen

Augenblick bzw. momentan der Schalter bei einer vorbestimmten Phase der Spannung von einer der Statorwicklungen bzw. -windungen des Synchron- bzw. Drehstromgenerators zu einer Zeit geschlossen wird, zu der die Leitung zwischen den Statorwicklungen bzw. -windungen (12) umschaltet; und
wobei der Ausgang des Synchron- bzw. Wechselstromgenerators durch Übergeben eines Ausgangs (26) der Spannungsregelschaltung (24) an die Synchron- bzw. Wechselstromgeneratorfeldwindung bzw. -wicklung geregelt wird.

7. Verfahren nach Anspruch 6, das ferner aufweist, daß eine Eingangsspannung mit der Spannungsregelschaltung (24) integriert wird.

8. Verfahren nach Anspruch 6, das ferner aufweist, daß eine Eingangsspannung mit der Spannungsregelschaltung (24) während eines festen Teils einer gesamten Zeitzyklusdauer von einer der Statorwicklungen bzw. -windungen (12) integriert wird.

9. Verfahren nach Anspruch 6, das ferner aufweist, daß eine Eingangsspannung zu der Spannungsregelschaltung (24) während einer gesamten Zeitzyklusdauer von einer der Statorwicklungen bzw. -windungen (12) integriert wird.

Revendications

1. Circuit dans un système de véhicule pour réduire les ondulations à la sortie d'un alternateur multiphase ayant un bobinage d'excitation d'alternateur et plusieurs bobinages de stator (12), ledit système de véhicule ayant un circuit régulateur (24) ayant une sortie (26) pour délivrer un signal au bobinage d'excitation d'alternateur afin de réguler la sortie de l'alternateur, caractérisé par :

   un interrupteur (20) relié en série entre une tension de batterie de système (21) et le circuit régulateur (24) ;
   ledit interrupteur (20) étant relié pour recevoir un signal (13) produit par un des bobinages de stator (12) afin d'être fermé momentanément en réponse à une forme d'onde de tension du dit des bobinages de stator à une phase prédéterminée de la tension du dit des bobinages de stator (12) au niveau d'un point de commutation de conduction entre les bobinages de stator.

2. Circuit de la revendication 1, dans lequel ledit interrupteur (20) est réglé pour être fermé afin de produire une forme d'onde rectangulaire à appliquer au circuit régulateur (24).

3. Circuit de la revendication 1 ou de la revendication 2, comprenant de plus un intégrateur pour intégrer une tension d'entrée dans le circuit régulateur (24).

4. Circuit de la revendication 3, dans lequel ledit intégrateur intègre ladite tension d'entrée pendant une fraction fixée d'une période de cycle temporel du dit des bobinages de stator (12).

5. Circuit de la revendication 3, dans lequel ledit intégrateur intègre ladite tension d'entrée pendant une période de cycle temporel entière du dit des bobinages de stator (12).

6. Procédé pour réduire les ondulations à la sortie d'un alternateur multi-phase ayant un bobinage d'excitation d'alternateur et plusieurs bobinages de stator (12) dans un véhicule ayant une tension de batterie de système (21) et un circuit régulateur de tension (24), caractérisé par :

   - l'apport d'un interrupteur relié en série entre la tension de système et le circuit régulateur de tension ;
   - la production d'un signal qui indique à quel moment la conduction commute entre les premier et second des bobinages de stator (12) ;

   en réponse audit signal, l'interconnexion entre la tension de batterie de système (21) et le circuit régulateur de tension (24) en fermant momentanément ledit interrupteur à une phase prédéterminée de la tension de l'un des bobinages de stator de l'alternateur à un moment où la conduction commute entre les bobinages de stator (12) ; et

   - la régulation de la sortie de l'alternateur en fournissant une sortie (26) du circuit régulateur de tension (24) au bobinage d'excitation d'alternateur.

7. Procédé de la revendication 6 comprenant de plus l'intégration d'une tension d'entrée dans le circuit régulateur de tension (24).

8. Procédé de la revendication 6, comprenant de plus l'intégration d'une tension d'entrée dans le circuit régulateur de tension (24) pendant une fraction fixée d'une période de cycle temporel entière de l'un des bobinages de stator (12).

9. Procédé de la revendication 6, comprenant de plus l'intégration d'une tension d'entrée dans le circuit régulateur de tension (24) pendant une période de cycle temporel entière de l'un des bobinages de stator (12).

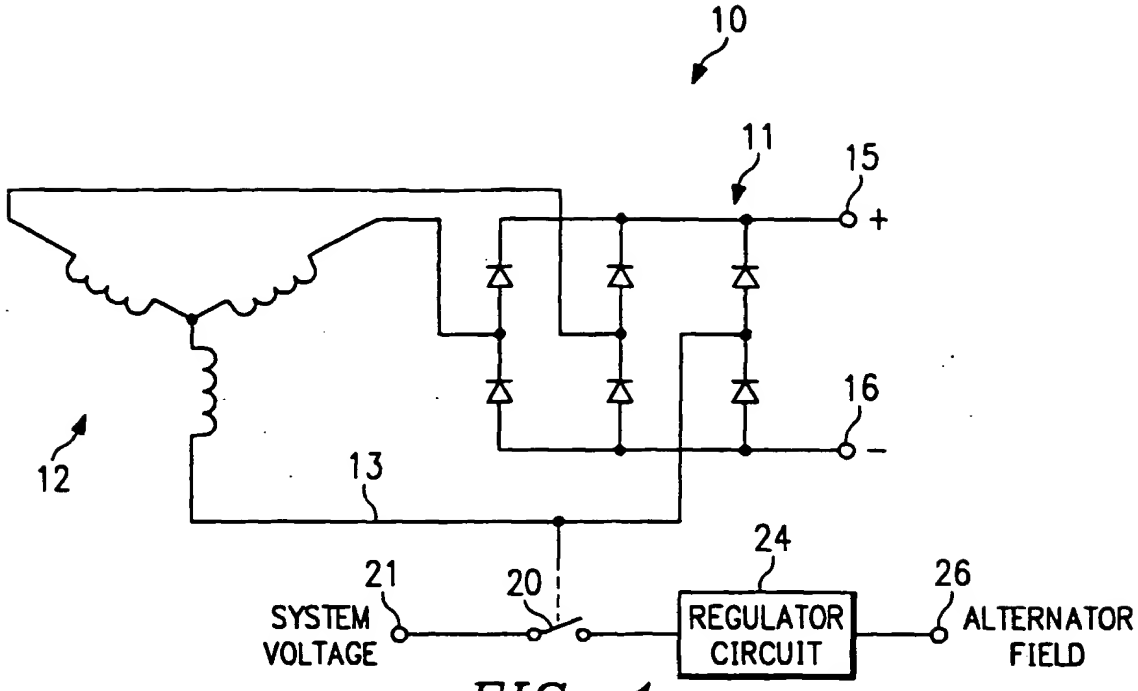
10
11
15
+
16
–
12
13
24
21
20
26
SYSTEM VOLTAGE
REGULATOR CIRCUIT
ALTERNATOR FIELD

FIG. 1

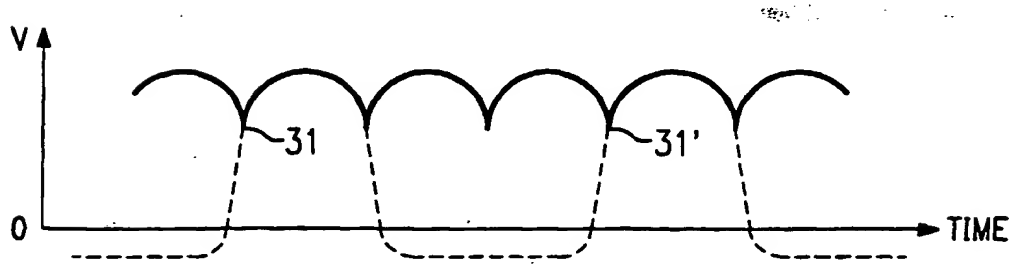
V
31
31'
0
TIME

FIG. 2